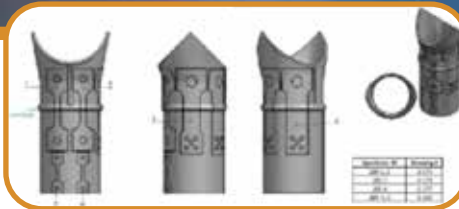


Marshall Space Flight Center Mechanical Testing

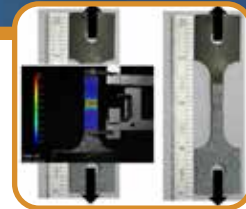
Engineering Solutions for Space Science and Exploration



Custom Sub-Scale Test
Sample



Custom Sample Design and Drawings



Digital Image Correlation
on Tensile Sample

The **Materials and Processes Laboratory's Mechanical Test** team conducts a wide variety of tests in order to characterize the behavior of materials under various conditions in various environments. This team can perform standard American Society for Testing and Materials (ASTM) test methods, in addition to nonstandard mechanical tests in air, helium, nitrogen, hydrogen, and methane from elevated temperatures to cryogenic temperatures. Engineers are available to provide guidance in test plan development and execution, specimen design, and cut-plan design. Skilled machinists on site are also available for manufacturing test samples using computer numerical controlled (CNC) and electrical discharge machining (EDM) tools. Static and dynamic material characterization can be evaluated in simulated service environments with computerized data acquisition, including digital image correlation (DIC). Custom testing of components or structural analog testing can also be designed and conducted. United States Government and industry specifications are supported for any standard test type. This facility is ISO9001 and ISO17025 compliant for mechanical testing and calibration. Consulting services are offered in all areas.



Tension Test Specimen in Liquid Hydrogen

Key Benefits

Building 4602 Test Facility

- Twenty-five mechanical test frames
- Tension/compression load capability up to 265 kips
- Torque-tension testing of threaded fasteners up to 1000 ft-pounds
- Elevated temperature testing in air up to 1,800 °F
- Cryogenic temperature testing capability down to -320 °F
- Test environments include air, and gaseous or liquid nitrogen. Liquid helium (-450 °F) testing capability is under development
- Standard test configurations include ASTM mechanical tests (e.g., tension, compression, modulus, HCF, LCF, da/dN, fracture toughness (all varieties), creep, shear, bending, and hardness).
- Non-standard coupon tests (application specific) may include simulated service tests, small scale structural component tests, analog structural component tests, and various fastener tests
- Data acquisition methods include digital image correlation (measure surface coordinates, displacements, velocities, and strain values and rates in 3D); strain gages, LVDT, clip gages, and extensometers; multi-channel data acquisition systems at variable frequencies

Building 4628 Test Facility

- The hydrogen test facility (HTF) is capable of performing an extensive range of tests with procedures developed on demand.
- Fourteen custom test systems are operated in ten structurally reinforced test cells
- Tension/compression load capability up to 220 kips in liquid hydrogen
- Variable temperature testing in high pressure gaseous helium, hydrogen, or methane at temperature ranging from -200 °F to 1,800 °F
- Cryogenic temperature testing capability at -423 °F (LH2) and -320 °F (LN2)
- High-pressure cryogenic permeability tests in liquid hydrogen at pressures up to 300 psi
- Test systems capable of testing in pressurized gasses up to 10,000 psi
- Test configurations include standard ASTM tests (HCF, LCF, da/dN, fracture toughness, tension, compression, modulus), non-standard coupon tests (application specific), simulated service tests
- Data acquisition includes strain gages, LVDT, clip gages, extensometers; multi-channel data acquisition systems at variable data acquisition frequencies are available.

For more information, please visit www.nasa.gov/centers/marshall/about/business.html

National Aeronautics and Space Administration
George C. Marshall Space Flight Center
Huntsville, AL 35812
www.nasa.gov/marshall